

B. Low-End Adjustment

While NYNEX continues to recommend three no-sharing X-Factor options reflecting levels of competition, if sharing is retained for any X-Factor option, then regulatory symmetry and equity require that the low-end adjustment also be retained.

AT&T argues that the low-end adjustment must be eliminated whether or not sharing is retained. According to AT&T, the low end adjustment has not served its purpose, and LECs like NYNEX have misused it.⁶⁷ AT&T's argument has no basis.

The low-end adjustment has been inextricably intertwined with the sharing mechanism; it would be arbitrary to eliminate or retain one without the other.⁶⁸ The Commission has consistently viewed sharing and the low-end adjustment as a unified "backstop" which in a symmetrical manner protects against unreasonably high or low rates.⁶⁹

AT&T specifically alleges that NYNEX misused the low-end adjustment by recouping 1991 corporate "downsizing" expenses in the 1992 Annual Access Tariff Filing.⁷⁰ AT&T is wrong, and the Commission rejected such arguments by AT&T and MCI in the proceeding on that 1992 filing. The Commission found that NYNEX's accounting for the costs in question was entirely proper, and in fact benefited ratepayers through normalization.⁷¹ The Commission also declined to "look behind a carrier's

⁶⁷ AT&T 39-41.

⁶⁸ NYNEX's position, of course, is that both should be eliminated.

⁶⁹ See X-Factor NPRM at ¶¶ 112-16; LEC Price Cap Review Order at ¶¶ 166-69, 184-87, 223; 1992 Annual Access Tariff Filings, 7 FCC Rcd. 4731, ¶ 4 (CCB 1992). See also SWBT 34-35. Even MCI (at p. 20) acknowledges that a price cap plan must balance shareholder and ratepayer interests.

⁷⁰ AT&T 40.

⁷¹ 7 FCC Rcd. 4731, ¶¶ 12-13. NYNEX's one-time accounting adjustments have been typical in the rapidly changing telecommunications industry, not to mention other industries. See also LEC Price Cap Review Order at ¶ 234 (FCC stated it has been monitoring fourth quarter adjustments for several years, and it has found no evidence that the adjustments were improper).

reported total interstate earnings to decide whether a particular cost should be counted for the purpose of applying the low-end adjustment mechanism or sharing.”⁷² In any event, as demonstrated by NYNEX in that proceeding, NYNEX’s 1992 low-end adjustment did not result only from one-time accounting adjustments.⁷³ The Commission should not eliminate the low end adjustment simply because such accounting adjustments, like other cost accruals, affect a company’s earnings.

Finally, in the LEC Price Cap Review Order, the Commission rejected MCI’s argument (the same as AT&T’s here) that the low-end adjustment is unnecessary given that LECs can make above-cap filings or file waivers if their rates are so low as to be confiscatory.⁷⁴ The Commission found those mechanisms can be unduly burdensome for the Commission, LECs and customers, as well as onerous for LECs. The Commission also observed that “it may not be reasonable to require sharing when LECs experience high earnings without allowing a low-end adjustment when those LECs experience low earnings.”⁷⁵ AT&T provides no grounds for the Commission to reach a different result on the low-end adjustment in this matter.

C. “Reinitializing” Rates

MCI argues that if the Commission proceeds with a total company TFP methodology for determining X-Factors, the Commission must first reinitialize LEC

⁷² 7 FCC Rcd. 4731, ¶ 11.

⁷³ Reply of the NYNEX Telephone Companies, 1992 Annual Access Tariff Filings, Transmittal Nos. 86, 89, filed May 14, 1992, Appendix A, p. 4 n. 9. AT&T and MCI recognize that the NYNEX Telephone Companies would have qualified for a low-end adjustment even if they had not incurred the Fourth Quarter 1991 expense accruals.

⁷⁴ LEC Price Cap Review Order at ¶ 223.

⁷⁵ Id., citing AT&T v. FCC, 836 F.2d 1386 (D.C. Cir. 1988).

interstate access rates to their direct economic costs. According to MCI, this is necessary to prevent a “windfall” to LECs.⁷⁶

MCI’s argument is mistaken and should be summarily dismissed. As previously discussed, the Christensen moving average TFP provides a reasonable baseline which reflects actual productivity of LECs and assures the timely flow of efficiency gains to consumers. Moreover, MCI’s tired plea for a return to cost-plus, rate of return regulation of rates must be rejected as fundamentally contrary to principles of FCC price cap regulation. The purpose of price caps is not to radically reinitialize rates to economic costs, but to encourage LEC efficiency improvements which will benefit customers. In 1991, price cap rates were initialized based upon July 1990 rates under rate of regulation; no further initializing is appropriate. Finally, MCI or any other access customer can always file a Section 208 complaint alleging that a LEC’s rates are unjust and unreasonable under Section 201 of the Communications Act.

V. NOTWITHSTANDING OPPOSING COMMENTS, NYNEX’s PRO-COMPETITIVE FRAMEWORK OF MULTIPLE X-FACTORS IS WELL-SUPPORTED IN POLICY AND ECONOMICS AND SHOULD BE ADOPTED

NYNEX has presented a proposal for three productivity offset options, adapted to marketplace changes and the development of competition.⁷⁷ The first level of productivity offset (Baseline X) is based on LEC historical moving average TFP plus a fixed factor interstate adjustment, to the extent that one can be economically determined. The second level offset, Baseline X - (.25)X, is available when barriers to competition have been removed in areas or jurisdictions representing 75% of a LEC’s access lines, as shown by

⁷⁶ See also TRA.

⁷⁷ NYNEX 2-3, 4-12.

compliance with an objective checklist; and a competitor is operational in the region. The third level offset, Baseline X - (.40)X, is available when, in addition to barriers to competition having been removed in all service areas, there is a measurable competitive presence; i.e., competitors are present in areas representing, e.g., 40%-50% of the LEC's business access lines (or 40%-50% of revenue for special access). The record provides significant support for NYNEX's position.⁷⁸ Even ICA states that the Commission should devote more resources to promoting competition and use any resulting effective competition to reduce regulation of the incumbents.⁷⁹

Some commentators expressing views at odds with NYNEX's position state that competition will increase, not decrease productivity;⁸⁰ and that the level of competition today does not justify regulatory relief with regard to X-Factor.⁸¹ These commentators' arguments miss the mark.

Importantly, while one might debate the facts regarding the state or pace of competition developing in different areas, NYNEX's proposal is firmly based on policy grounds. That is, the FCC's (and Congress') pro-competitive policies are advanced by encouraging price cap LECs to open up markets to and foster increasing competition.⁸² This encouragement takes the form of offering progressively lower X-Factor options as the market evolves towards full competition. It is far superior to reward price cap LECs with a lower X-Factor for pro-competitive activities. than to penalize price cap LECs with a

⁷⁸ See, e.g., Ameritech 2, 12, Frontier 8-9, Lincoln, SNET.

⁷⁹ ICA 2.

⁸⁰ See MCI 26, Sprint 12, TRA 8.

⁸¹ See API 9-10, MCI 26, Sprint 12, TRA 8, Time Warner 1-2.

⁸² See also Telecommunications Act of 1996, Section 706.

higher X-Factor for sharing to be eliminated (see supra). Further, as the Commission has observed:

Our price cap system of regulation must be adaptable to the development of competition in local markets and, where possible, encourage the development of efficient competition. Specifically, we must relax regulatory restraints on LECs in markets as competition develops and a competitive presence is established.⁸³

Some parties do not endorse an evolutionary model such as NYNEX's, but rather propose that competitive services be entirely removed from price cap regulation.⁸⁴ While we agree with that goal, the NYNEX proposal provides for an orderly transition to full competition with appropriate pro-competitive incentives built in along the way. Ultimately, we envision that full competition will allow for streamlined regulation and then non-dominant status with respect to price cap services.

A few parties assert that a competitive checklist tied to regulatory relief such as X-Factor must reflect actual, not merely potential competition.⁸⁵ NYNEX's proposal is responsive to that concern, since our proposed Level II entails a competitor being operational in the region and our proposed Level III entails significant operational competitive presence.

Contrary to some parties' assertions, NYNEX's proposal is soundly based in economics as well. For example, MCI baldly asserts that "[i]t is ludicrous to believe that productivity will fall as competition grows [T]he LECs will have to become more

⁸³ LEC Price Cap Review Order at ¶ 25.

⁸⁴ See Bell Atlantic 17, GSA, SWBT 28, Time Warner 2, 5. SWBT states that (p. 27): "so long as there are market areas or service segments that have not achieved the fully competitive status which represents the regulators' ideal, there must remain in the regulatory paradigm sufficient financial incentives for shareholders to encourage efficient behavior, if, in fact, efficient behavior is to be fostered."

⁸⁵ MCI 26, TRA 8.

productive as competition increases.”⁸⁶ However, during the transition to a competitive marketplace, competitive forces will in the short run reduce a LECs’ outputs faster than inputs can be reduced, thereby lowering TFP. Further, as Frontier points out (at pp. 8-9): “As exchange carriers lose market share to new entrants, their ability to realize economies of scale will diminish, thereby resulting in lower achievable productivity gains.” For the long term, of course, economic theory provides that competition will likely have an upward impact on a company’s productivity if the company is to survive.⁸⁷

U S WEST supports multiple no-sharing X-Factor options based upon economies of density considering serving area size, geography and demographics (including demand density).⁸⁸ However, the record does not justify this proposal. A correlation between higher density and higher productivity has not been established and should not be assumed. For example, high density suggests market segments more attractive to competitive inroads which will lower output growth and lower productivity.⁸⁹

Finally, some commenting parties oppose price cap LECs’ ability to select an X-Factor option on an annual basis.⁹⁰ For example, AT&T and MCI suggest that LECs will manipulate the process to load expenses into low X-Factor years (reducing earnings affecting sharing/low-end adjustments). This is just baseless speculation that LEC accounting practices will be improper; any specific allegation of this type can appropriately be dealt with on a case by case basis. The benefits of annual X-Factor selections are substantial. In this way, the FCC can apply ongoing incentives for carrier behavior

⁸⁶ MCI 26.

⁸⁷ See NYNEX 5-7.

⁸⁸ U S WEST 8-9.

⁸⁹ See also Pacific Bell 7-8.

⁹⁰ AT&T, Ad Hoc, MCI 22.

advancing FCC policies (such as NYNEX's pro-competitive proposal). Also, a carrier can choose an X-Factor option -- with a baseline reflecting industry average productivity -- that best fits its individual circumstances. At the same time, that carrier will have a strong incentive to improve efficiency and meet or beat the productivity factor.⁹¹

Finally, NYNEX recommends that if the Commission is not able to sufficiently resolve the issues in this proceeding to issue an Order reasonably in advance of the 1996 Annual Access Tariff Filing, then the interim price cap plan as set forth in the LEC Price Cap Review Order should be reflected in that filing and continued for the tariff year. This offers the Commission a reasonable option to deal with such significant challenges as budget cuts and the implementation of telecommunications legislation.

VI. THE COMMISSION SHOULD REJECT RECOMMENDATIONS THAT A PER-LINE COMMON LINE FORMULA BE ADOPTED

Some commentors ask the Commission to adopt a per-line common line formula.⁹² AT&T, for example, argues that the Commission has recognized that formula as superior, and that otherwise LECs would be rewarded for gains attributable to interexchange carriers.⁹³ This position is without foundation.⁹⁴

⁹¹ Similarly, NYNEX disagrees with commentors (e.g., Ad Hoc, BellSouth, GTE) that advocate only one X-Factor option. The Commission should affirm its tentative conclusion to employ multiple X-Factor options and avoid a "one-size-fits-all" rule. See LEC Price Cap Review Order at ¶ 145; X-Factor NPRM at ¶ 9. The multiple option approach will enable the Commission to incent pro-competitive, efficiency-enhancing conduct.

⁹² E.g., AT&T, Sprint.

⁹³ AT&T 41-42.

⁹⁴ Additionally, Sprint's recommendation (at p. 13) of a common line per-line capping mechanism, where common line revenue per line is capped at the base year level, is without basis. This proposal would create a disincentive for price cap LECs to set the CCL rate below the maximum allowable rate, since the LEC would lose any existing pricing headroom in the next annual filing. No persuasive justification is presented by Sprint for this methodology.

The Commission has not already determined that a per-line formula is best; rather, the Commission recognized that the choice of productivity factor methodology and common line formula are interrelated and has sought further comment in this area.⁹⁵ As MCI recognizes, the productivity factor methodology adopted as a result of this proceeding may subsume demand growth and obviate any per-line formula.⁹⁶ NYNEX has demonstrated that the Christensen moving average TFP methodology captures all changes in LEC productivity over time, whether driven by demand growth changes in minutes or lines, and therefore removes the need for any separate common line formula.⁹⁷

We have also shown that, if a separate common line formula is retained, a per-line formula would be inappropriate. The Commission's suggestion that LECs have little influence over growth in common line usage⁹⁸ is not supported by the record. Among other things, LEC access rate reductions and new service features have stimulated growth in minutes of use.⁹⁹

VII. THE COMMISSION SHOULD NOT FURTHER LIMIT EXOGENOUS COST CHANGES AS PROPOSED BY MCI

MCI argues that allowable exogenous costs should be limited to those changes that cause jurisdictional shifts.¹⁰⁰ According to MCI, this approach will simplify the process and treat LECs like nonregulated companies. MCI's arguments are unpersuasive.

⁹⁵ See LEC Price Cap Review Order at ¶¶ 269-73; X-Factor NPRM at ¶¶ 132-37.

⁹⁶ See MCI 72.

⁹⁷ NYNEX 28-29. See also USTA. Sprint suggests (at p. 13) that an X-Factor that captures all changes in LEC productivity over time inappropriately spreads the results of common line minutes of use growth to all baskets, rather than being directly applied to carrier common line charges. Sprint implies that separate baseline productivity offsets should be developed by basket of services. However, the Commission declined to implement such an approach for the first four years of price caps, and there is no basis to introduce this level of complexity into the LEC price cap plan at this time.

⁹⁸ See LEC Price Cap Review Order at ¶¶ 268-69; X-Factor NPRM at ¶ 132.

⁹⁹ NYNEX 29-31. See also Frontier 10-11.

¹⁰⁰ MCI 25-26. See also ICA.

As we have pointed out, the Christensen moving average TFP methodology will appropriately simplify the exogenous cost process. That TFP methodology will include costs borne by LECs and reflect them in the productivity offset in a timely manner. This will obviate exogenous cost adjustments except for such changes as jurisdictional Separations or allocations between regulated and nonregulated activities, which will impact interstate revenue requirements in ways not captured by that TFP methodology.¹⁰¹ Also, costs truly unique to particular LECs that would not be captured by that methodology should be eligible for exogenous treatment. Accordingly, even under that TFP methodology, MCI's proposal does not go far enough.

If the TFP methodology as recommended by NYNEX is not adopted, then the FCC should at least maintain its current recognition of allowable exogenous cost changes.¹⁰² In this scenario, MCI's proposed limitation would clearly be inappropriate, as it would unfairly deny LECs recovery for costs outside their control. MCI is wrong in stating that nonregulated companies must determine how to meet such cost changes without being able to change their prices. Such companies have the option of changing their prices, subject to marketplace reactions. Comparable treatment, then, would be to allow LECs to decide whether to reflect exogenous cost changes in their prices.

MCI's position is also internally inconsistent and arbitrarily one-sided. As discussed earlier, MCI would reinitialize LEC prices down to economic costs, thereby treating such costs as exogenous, but would deny LECs the ability to raise prices to recover most kinds of exogenous cost increases.

¹⁰¹ NYNEX 32-34. See LEC Price Cap Review Order at ¶¶ 292, 303.

¹⁰² See also AT&T 44-46 (AT&T argues that the Commission should not change the existing rules governing exogenous cost adjustments); accord Sprint 14-15.

VIII. CONCLUSION

The Commission should not adopt opposing commentators' proposals which would detract from the Commission achieving its pro-competitive goals, improving efficiency incentives and easing regulatory burdens.

Respectfully submitted,

The NYNEX Telephone Companies

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Dated: March 1, 1996
94-lx-f.rep

CERTIFICATE OF SERVICE

I, Bernadette Chawke, hereby certify that copies of the foregoing **NYNEX REPLY COMMENTS** were served on the parties listed on the attached service list, this 1st day of March, 1996, by first class United States mail, postage prepaid.


Bernadette Chawke

ATTACHMENT A

“Total Factor Productivity Methods for Local Exchange Carrier Price Cap Plans: Reply Comments”

**Laurits R. Christensen, Philip E. Schoech,
and Mark E. Meitzen**

Christensen Associates

USTA Reply Comments 3/1/96

Total Factor Productivity Methods for Local Exchange Carrier Price Cap Plans: Reply Comments

Laurits R. Christensen, Philip E. Schoech, and
Mark E. Meitzen
March 1, 1996

I. Introduction

In response to the issues raised in the Fourth Further Notice of Proposed Rulemaking in CC Docket 94-1 ("Fourth FNPRM"),¹ we developed a simplified TFP model that eases computational requirements and relies entirely on verifiable, publicly-available data.² The simplified model, which forms the basis of the Total Factor Productivity Review Plan (TFPRP)³, is consistent with accepted productivity measurement practices and provides an accurate measure of LEC productivity. Because it is based solely on publicly-available data and relies on simplification of some computations, it can be updated and verified in a straightforward manner.⁴ We believe the TFPRP is the only TFP model proposed by any party that addresses all substantive comments raised by the Commission.

The primary purpose of our reply comments is to respond to issues raised by AT&T and the Ad Hoc Telecommunications Users Committee in their comments to the

¹ Federal Communications Commission, Fourth Further Notice of Proposed Rulemaking, FCC 95-406, September 27, 1995.

² Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Total Factor Productivity Methods for Local Exchange Carrier Price Cap Plans," Attachment A to Comments of United States Telephone Association on Fourth Further Notice of Proposed Rulemaking, CC Docket 94-1, January 16, 1996 (hereafter referred to as "Christensen comments").

³ Attachment B to United States Telephone Association on Fourth Further Notice of Proposed Rulemaking, January 16, 1996.

⁴ A summary of the TFPRP can be found in the Executive Summary of the Christensen comments

Fourth FNPRM. Specifically, we are responding to the statement of Dr. J.R.

Norsworthy that was filed as Appendix A of the AT&T comments⁵ and the report by

Economics and Technology, Inc. ("ETI") that was filed with the Ad Hoc comments.⁶

Both the Norsworthy and ETI reports contain numerous critical comments regarding our original USTA LEC TFP study and the 1993 update to that study.⁷ While their critiques do not directly address the simplified data and methods that we described in our comments to the Fourth FNPRM filed on January 16, 1996, most of the methods and data sources used in the original Christensen TFP model and the simplified Christensen TFP model are the same. In order to avoid confusion, we will address the relevance of the Norsworthy and ETI comments to the simplified TFP model.

After careful review of the Norsworthy and ETI statements, we have found none of the criticisms to be justified. Many of the criticisms are based on a misunderstanding of the data used in the Christensen TFP models. Other criticisms are based on a misunderstanding of the methods used to compute TFP or on incorrect inferences from economic theory. None of the criticisms lead to the conclusion that the simplified TFP model needs to be corrected in any way.

The following sections of this report respond to the issues raised in the

⁵ "Analysis of TFP Methods for Measuring the X-Factor of the Local Exchange Carriers' Interstate Access Services," Appendix A to Comments of AT&T on Fourth Further Notice of Proposed Rulemaking, CC Docket 94-1, January 16, 1996 (hereafter referred to as the "Norsworthy report")

⁶ "Establishing the X-Factor for the FCC Long-Term LEC Price Cap Plan," attached to Comments of Ad Hoc Telecommunications Users Committee on Fourth Further Notice of Proposed Rulemaking, CC Docket 94-1, January 16, 1996 (hereafter referred to as the "ETI report")

⁷ "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation," May 3, 1994 (hereafter referred to as the "original study"); and "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," January 16, 1995 (hereafter referred to as the "updated study")

Norsworthy and ETI reports. In particular, we find that the only economically meaningful measure of productivity is LEC total factor productivity and that any measure of "interstate productivity" is not economically meaningful. We furthermore find that the alternative methods offered by Norsworthy and ETI for measurement of output, capital, and materials contain fundamental flaws and are inappropriate for purposes of measuring LEC productivity. Finally, we find that the simplified TFP model needs no modification, and is the appropriate basis for measuring LEC TFP.

II. All Data used in the Simplified Christensen TFP Model are publicly-available and verifiable

Dr. Norsworthy incorrectly asserts that our TFP model relies heavily on non-public proprietary data. While we disagree with his characterization of the original TFP model, this assertion is entirely false for the simplified TFP model. The simplified TFP model is based entirely on publicly-available data. Dr. Norsworthy seems particularly concerned about the use of proprietary data in the construction of the benchmark and asset prices. The simplified TFP model bases the benchmark on ARMIS data and data on the telephone industry collected and published by the U.S. Bureau of Economic Analysis. The asset price indexes are based on prices published by the U.S. Bureau of Economic Analysis, the source recommended by Dr. Norsworthy. Given that the TFPRP model is based entirely on publicly-available data, Dr. Norsworthy's concern is irrelevant.

Similarly, ETI begins its comments with the "empirical requirements" identified in

the Fourth FNPRM for an appropriate X factor and concludes that the Christensen LEC TFP study fails to meet these requirements. As we discuss below in Section XIV, ETI also goes to great lengths to report on the recent California state proceedings where both Dr. Christensen and Dr. Selwyn testified. The ETI report inaccurately portrays the Christensen study. As explained in our comments to the Fourth FNPRM, the simplified Christensen study has addressed the Commission's concerns about data and methodological issues. Therefore, the ETI concerns have no practical significance.

III. The computation of TFP for only interstate access services is not economically valid

Both the Norsworthy and ETI reports advocate the computation of an "interstate-only" TFP. They falsely claim that one can measure interstate TFP by assuming that inputs grow at the same rates for interstate access and other regulated telephone services provided by the LECs.⁸ As both we and NERA noted in our comments to the Fourth FNPRM,⁹ there is no economically valid partition of LEC inputs into interstate and intrastate inputs. Therefore, there is no economically valid procedure for measuring interstate TFP, Dr. Norsworthy's and ETI's claims notwithstanding.

To separately measure the growth of inputs for interstate services and inputs for

⁸ Although ETI advocates the computation of jurisdictional costs based on Part 36, they conclude that interstate input growth can be approximated by total company input growth. ETI report, p. 50.

⁹ Christensen comments, pp. 26-27 and William E. Taylor, Timothy J. Tardiff and Charles J. Zarkadas, "Economic Evaluation of Selected Issues from the Fourth Further Notice of Proposed Rulemaking in the LEC Price Cap Performance Review," Attachment C to United States Telephone Association on Fourth Further Notice of Proposed Rulemaking, January 16, 1996, pp. 14-21.

intrastate services would require a meaningful distinction between inputs for interstate services from inputs for intrastate services. Since interstate and intrastate services are produced with joint and common inputs, this would require some arbitrary allocation of the inputs (and their costs). Dr. Norsworthy and ETI perform this arbitrary allocation by simply, and without justification, assuming that inputs and costs grow at the same rate for interstate and intrastate services. As we demonstrate below, this allocation is not economically meaningful and the resulting measure of "interstate productivity" is not valid.

Dr. Norsworthy erroneously claims "the USTA assertion that there is no basis for measuring interstate activity separately is therefore belied by its own model."¹⁰ His claim is based on the observation that one can compute distinct interstate output from the USTA data set. But computing output is only half of the problem in TFP measurement. Dr. Norsworthy has offered no solution to the problem of computing an economically meaningful measure of interstate input--and he cannot do so because there is no solution to the problem.

Dr. Norsworthy makes an additional claim that one can assume inputs for interstate and intrastate services grow at the same rate without making any specific allocation of costs. While one can "make" this assumption, it provides an economically meaningless result. Assume for a moment that his claim is true. Then one would be able to meaningfully calculate product line productivity for any multi-product firm. Consider for example a paper-clip manufacturer that produces red and blue paper clips.

¹⁰ Norsworthy report, p. 24

Except for the pigment applied to the paper clip, the process of producing red and blue paper clips is exactly the same. In Table 1, we consider a case where sales of red paper clips increase by 5% while sales of blue paper clips increase 3%, leading to a 4% increase in total paper clip sales. Total input increases 2% and total factor productivity of paper clip production increases by 2%. The assumption that inputs for red and blue paper clips grow at the same rate as total input would lead to the conclusion that productivity growth for red paper clips has been 3% while productivity growth for blue paper clips was only 1%.

Table 1
TFP for a Paper Clip Manufacturer

	1994	1995
Red Paper Clips Sold (millions)	100	105
Blue Paper Clips Sold (millions)	100	103
Total Paper Clips Sold (millions)	200	208
Total Output (1994=100)	100	104
Total Input (1994=100)	100	102
Actual TFP (1994=100)	100	102
Incorrectly Computed Red Paper Clip TFP	100	103
Incorrectly Computed Blue Paper Clip TFP	100	101

If the price of paper clips were regulated, the assumption that inputs for red and blue paper clips grow at the same rate as total input would lead to the insupportable conclusion that the price of red paper clips should be reduced 2 percent relative to blue paper clips. Since one can easily create examples where this assumption yields arbitrary and capricious results, one must conclude that his claim has no economic justification.

IV. The Tornqvist index is the proper choice for productivity research.

Dr. Norsworthy criticizes our LEC TFP model for using the Tornqvist index when constructing total output and total input.¹¹ He falsely characterizes the Tornqvist index as a "poor" choice and recommends the use of an alternative index, the Fisher Ideal index. The Tornqvist index and the Fisher Ideal index have very similar properties and, in fact, they produce identical results in the LEC TFP model. For the simplified TFPRP model, Table 2 shows the rates of total output, total input, and TFP growth when the Tornqvist index is used, and their rates of growth when the Fisher Ideal index is used. As one can see from the table, the results are identical.

¹¹ e.g., Norsworthy report, p. 21-24.

Table 2
Comparison of Total Output, Total Input, and LEC TFP Growth
Using Tornqvist and Fisher Ideal Indexes
TFPRP Model

	Tornqvist Index			Fisher Ideal Index		
	Total Output	Total Input	TFP	Total Output	Total Input	TFP
1988						
1989	4.7%	2.9%	1.8%	4.7%	2.9%	1.8%
1990	3.8%	0.0%	3.8%	3.8%	0.0%	3.8%
1991	2.7%	0.7%	2.0%	2.7%	0.7%	2.0%
1992	2.0%	-1.5%	3.5%	2.0%	-1.5%	3.5%
1993	4.0%	0.3%	3.7%	4.0%	0.3%	3.7%
1994	3.8%	1.4%	2.4%	3.8%	1.4%	2.4%
Five-Year Averages						
1988-93	3.5%	0.5%	2.9%	3.5%	0.5%	2.9%
1989-94	3.3%	0.2%	3.1%	3.3%	0.2%	3.1%

The fact that the Tornqvist index and the Fisher Ideal index produce identical results is not surprising. Both the Tornqvist index and the Fisher Ideal index are "superlative" index numbers¹² and accurately reflect price and quantity changes for a wide variety of production structures.

Furthermore, even Dr. Norsworthy recognizes that the Tornqvist index and the Fisher Ideal index will generally produce very similar results. In his analysis of total input growth, he states that "total factor input is the sum of indices of individual inputs weighted by their respective shares in total factor cost."¹³ He goes on: "The statement

¹² See W. E. Diewert, "Exact and Superlative Index Numbers," Journal of Econometrics, Vol. 4 (1976), pp. 115-145.

¹³ Norsworthy report, p. 39

holds exactly for the Tornqvist Index in the USTA model. It is approximate *to a rather high degree of accuracy* (emphasis added) in the Fisher Ideal Index used in the Performance-Based Model."⁴

The Tornqvist index has been widely used in productivity research, and it is currently employed by the U.S. Bureau of Labor Statistics in its total factor productivity research. Because the Tornqvist index and Fisher Ideal Index produce the same quantitative results, and because the Tornqvist index is more widely employed in productivity research, we believe that the Tornqvist index is more appropriate for the simplified TFP model.

V. The Christensen output indexes are properly calculated

The ETI report criticizes the Christensen study for allegedly using *ad hoc* methods that were not clearly documented. This allegation is incorrect. We specified in detail in our original study how the output indexes are computed, and we elaborated on our procedures in our comments to the Fourth FNPRM. The output price indexes in question are used to deflate revenues to produce quantity indexes for three services: local, intrastate access, and long distance. As we explain, the formula we use converts Form M rate change data into an index that closely approximates a chain-weighted Paasche price index. The chain-weighted Paasche price index is a conventional price index formula that is theoretically superior to traditional fixed-weight Laspeyres and

⁴ Norsworthy report, p. 39 fn. 15

Paasche price indexes.¹⁵

In addition, Dr. Norsworthy and ETI incorrectly criticize price and quantity indexes for specific service categories. Dr. Norsworthy's criticism of our interstate access measures is based on a misunderstanding of the data used to construct them.¹⁶ Dr. Norsworthy makes a false distinction between the construction of his interstate access quantity indexes and our interstate access indexes. He characterizes his interstate access quantity indexes as being based on physical units of output and characterizes our quantity indexes as being based on deflated revenue. ETI also makes this false distinction.¹⁷

As we discussed in our original TFP study report (page 3), the price indexes we used in our LEC TFP model for end-user access and interstate switched access are derived directly from physical output measures (in fact from the very same physical output measures recommended and used by Dr. Norsworthy). The price of end-user access is the ratio of revenue to the number of access lines. The price of switched access is constructed by first computing a Tornqvist quantity index of common line minutes of use and traffic sensitive minutes of use and then dividing total switched access revenue by this quantity index. This means that the end-user service quantity index is based on the number of access lines and the total switched access service quantity index is a Tornqvist index of common line and traffic sensitive minutes-of-use.

The only subclass of interstate access where Dr. Norsworthy's methods differ

¹⁵ See Christensen comments, p. 5

¹⁶ Norsworthy report, p. 23

¹⁷ ETI comments, pp. 17-18

from those in the simplified TFP model is special access. Dr. Norsworthy bases his quantity index for special access on the number of special access lines, a simplistic choice for measuring special access output.¹⁸ Our special access output index is based on an economic price index of special access services and accurately reflects those services sold by the LECs.

Dr. Norsworthy also criticizes our local and long distance output indexes and erroneously states that they "may understate output because the price indices may not include discounts - a major element of competition in long distance service - while the revenues do."¹⁹ Dr. Norsworthy appears to confuse the market for inter-exchange service, where discounting is a significant activity, with the market for local and intra-LATA toll, where discounting from tariffed rates is less common. Dr. Norsworthy also proposes to measure local and long distance service using two physical measures of output: number of local calls and toll minutes of use. As we discussed in our original TFP model report (page 1) the heterogeneity of telephone service makes it inappropriate to use simple measures of physical output. Local service includes access, usage, and vertical services. Long distance service includes message service, unidirectional service, and private line service. These services are further differentiated by numerous characteristics such as distance and time-of-day. The number of local

¹⁸ Dr. Norsworthy also incorrectly asserts (page 73) that "the USTA model is distorted by the price for special access services, which rises from an index value of 100% (sic) in 1984 to over 700% (sic) in 1989." He cites as his source worksheets submitted by Christensen Associates in the California PUC proceedings. Dr. Norsworthy's assertion is incorrect. The special access price index is indexed to 1.000 in 1984 and has a value of .755 in 1993. Between 1984 and 1993 the annual rates of change vary from -7.94% to +2.57%. This was accurately reported in the workpapers cited by Dr. Norsworthy.

¹⁹ Norsworthy report, p. 25

calls and the number of toll minutes of use do not accurately account for the diverse rate elements in local and long distance revenue. Unlike Norsworthy's two physical measures of intrastate output, the quantity measures in our TFP model account for this diversity. Rate changes for each local and long distance service are accurately aggregated in the price indexes for local and long distance service. This leads to quantity indexes for local and long distance service that accurately reflect the mix of local and long distance services.

VI. The Simplified Christensen TFP Model correctly uses revenue weights to measure Total Output.

In Appendix 1 to our original TFP study report we provided a detailed explanation of why revenue weights should be used to measure total output when establishing a TFP benchmark.²⁰ We also noted in our comments that previous research into the measurement of telephone industry TFP shows that using cost elasticity (i.e. marginal cost) weights leads to substantially lower estimates of TFP growth.²¹ Any "new" research that purports to reverse this relationship must be viewed very critically. Dr. Norsworthy cites the difficulties he previously has had in obtaining meaningful marginal cost estimates for the Postal Service,²² he also admits that econometric estimates of marginal cost are often highly sensitive to small changes in

²⁰ This issue is also addressed in NERA's report, "Economic Performance of the LEC Price Cap Plan" (May 1994); and in William E. Taylor, Timothy J. Tardiff, and Charles J. Zarkadas, "Economic Evaluation of Selected Issues From the Fourth Further Notice of Proposed Rulemaking in the LEC Price Cap Performance Review: Reply Comments," NERA, March 1, 1996.

²¹ Christensen comments, p. 7.

²² Norsworthy report, pp. 60-61.

the model.²³ It is highly unlikely that Dr. Norsworthy would be able to develop a reasonable verifiable panel data set for estimating marginal costs, particularly since his measures of LEC outputs and inputs are fatally flawed (as discussed herein).

Because the data to estimate marginal cost weights may not be publicly-available, and because it is quite unlikely that good marginal cost estimates will be derivable from econometric methods, marginal cost weights are not an appropriate choice for the TFP model used to determine an X factor. Moreover, previous research into this area shows that the use of marginal cost weights would actually lower the X-factor. Any investigation into marginal cost weights is unwarranted. As we have consistently stated, a total output index based on revenue weights is appropriate for establishing an X factor in this proceeding.

VII. The Christensen Simplified TFP Model includes both debt and equity components in the opportunity cost of capital in an appropriate manner..

The Norsworthy and ETI reports criticize our cost of capital measure for not including both debt and equity components and for incorrectly treating the tax effect of debt versus equity.²⁴ While changes in Moody's bond yield provide a good proxy for changes in the LEC cost of capital for purposes of measuring LEC TFP growth, it does not incorporate an equity component. To address this concern, in the simplified model we have used the cost of capital for the U.S. economy, which includes both debt and

²³ Norsworthy report, p. 59

²⁴ Norsworthy report, pp. 45-47; ETI report, p. 20